

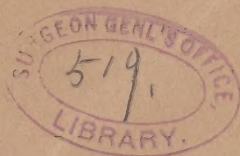
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BRIGGS (F. M.)

TORSION.

*With Description of an Automatic
Forceps for Rapid Torsion.*

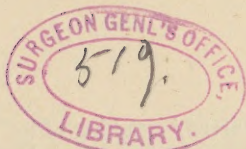
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TORSION; WITH DESCRIPTION OF AN AUTOMATIC FORCEPS FOR RAPID TORSION.¹

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ALTHOUGH torsion has several distinct advantages over any other method of treating hæmorrhage, and although with certain limitations it is both safe and practicable, it has never found general favor as a hæmostatic measure and is rarely made use of.

The method is a very ancient one, having been recognized and practiced in the first and second centuries. In the early part of the present century it came into use in France, but after having been tried for a while, was finally abandoned, as being unsafe when applied to large arteries.

Warren² states that torsion was brought to the notice of and was used by Velpeau in 1826; that it was also practiced by Amussat, who, in 1829, presented a paper on the subject to the Academy of France.

Ashhurst³ says that in this year (1829) it was successfully used in Germany; but was followed by several failures in France, and it was referred to Duijpytren for thorough investigation. His report was unfavorable to torsion except in the case of small arteries. After this the method went out of use, but was revived and practiced by Syme.

Bryant⁴ speaks of it very highly. In an experience of nine years, upon vessels of all sizes, he has never had a mishap, and he believes it to be the most perfect physiological method at command for the treatment of hæmorrhage.

¹ Read at the meeting of the Surgical Section of the Suffolk District Medical Society, May 6, 1891.

² The Healing of Arteries after Ligation in Man and Animals.

³ International Encyclopædia of Surgery.

⁴ Practice of Surgery.

Warren,⁵ speaking of its physiological value, refers to the experiments of Kocher, who concludes that: "Torsion enjoys with acutorsion and acupressure the great advantage of favoring a rapid coagulation, and also has its own special advantage of producing a much more intimate union between the thrombus and the vessel wall . . . these advantages are especially true of illimited torsion; when properly done, it is the ideal for small arteries."

Holmes,⁶ although believing it safe, prefers the carbolized ligature, and thinks, that "even the most experienced operator will find that it takes a long time to close all the vessels in a large stump by torsion . . . and that much more handling of the parts is required."

Gross⁷ is doubtful as to its safety upon large arteries, and Ashhurst⁸ is strongly opposed to it, being of the opinion that "the only truly efficacious means of arresting the hæmorrhage from large arteries are compression and ligation."

No method of treatment is justifiable which does not offer the greatest possible security against the occurrence of secondary hæmorrhage. Such an accident is too serious to admit of taking any chances, and, with opinion thus divided, it would certainly seem better to use the ligature upon such vessels as the femoral, carotid and axillary, and to confine the use of torsion to the smaller vessels, where the question of safety can be disregarded. But, with this limitation, there is still a very wide field for its use; for, where the femoral is tied once, numbers of ligatures are being put upon vessels small enough to come strictly within the limits of safe torsion.

Twisting is done in one of two ways. In limited

⁵ The Healing of Arteries after Ligature in Man and Animals.

⁶ System of Surgery.

⁷ System of Surgery.

⁸ International Encyclopædia of Surgery.

torsion the artery* is seized with one pair of forceps, drawn out of its bed, grasped at its deepest point by a second pair, and the portion between the two forceps is then twisted four to six times.

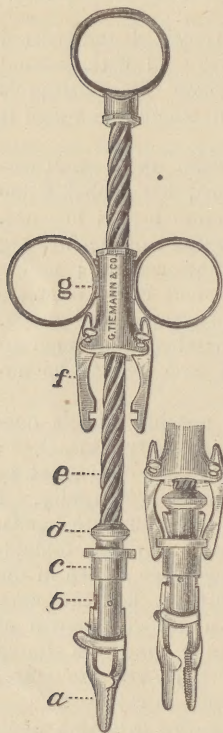
In illimited torsion the artery is seized and twisted with one pair of forceps, without the aid of the second pair — the fixed point against which the twisting is done being found in the tissues in which the vessel is embedded.

After having tried illimited torsion upon small vessels, some time ago, it seemed to me, that probably one reason why it is not in more common use, is because, with our present forceps and method of performing it, torsion is a slow and clumsy proceeding; and it occurred to me, that if an instrument could be made which would twist quickly and effectively, and which, at the same time could be easily handled, that such an instrument might be found useful as a general hæmostatic for the smaller vessels.

My first models had a box of gearing wheels connected with a rod, to which the forceps were attached; by turning a small handle the wheels were set in motion, and the forceps made to revolve rapidly. I abandoned this model for its use required both hands, and it needed too much manipulation. These difficulties have been overcome in the model as shown in the accompanying cut. This instrument has the very great advantage of being wholly under the control of one hand, and its mechanism is such, that by a simple up-and-down motion of the box (*g*) over the spiral rod (*e*) the vessel is seized, twisted and released.

Inspection of the cut will show the principle upon which it works, and this can be made clear by a few words of explanation. The instrument is taken with the thumb in the ring at the top, and the first and second fingers in the rings on the box (*g*). The hand

is opened and the box pushed firmly down. The arms (*f*) drop over and grasp the ring (*c*), carry it down, and the forceps spring open (as is shown in the smaller drawing).



Three-fifths of actual size.

It is then ready for use. The forceps are placed over the vessel and the box (*g*) is drawn up. The arms (*f*) pull up the ring (*c*) which presses against the upper ends of the forceps and closes them over the vessel. The arms then strike the projection at (*d*), spread open, and leave the ring (*c*) *in situ*, holding the forceps firmly locked. The forceps cannot be again opened until this ring has been pushed down. Torsion is performed by pulling up the box (*g*) three or four times, over the whole length of the spiral rod, that is to say, by closing and opening the hand three or four times. Drawing it up three times gives six full twists, which ought to be sufficient. When the torsion is completed, the vessel is released by again pushing the box firmly down. The arms (*f*) push down the ring (*c*) and the forceps spring open.

This whole performance, namely, seizing the vessel, twisting and releasing it, is perfectly simple and very rapid, as it takes only three to four seconds.

This instrument checks the bleeding, not only from those vessels which have a distinct vessel wall and can be easily isolated, but also from small bleeding points, provided they are seated in tissue which will allow them to be twisted. But in old cicatricial tissue, in the skin, etc., they are bound down, and tend to break off instead of twisting.

Regarding the instrument, it is to be noted that there is no backward rotation. When the box (*g*) is drawn up, the forceps revolve. When it is pushed down, the forceps are stationary. Of course, if the motion were reversed, the vessel would be untwisted, and the torsion of no value. A small ratchet in the thumb piece allows the spiral rod to turn in one direction, but acts as a brake to prevent it from turning in the opposite direction. The box (*g*) contains a brass cylinder, fitting closely upon the grooves of the spiral rod, and toothed at its lower end. When the box is drawn up the teeth engage, making a solid body of the box and cylinder, and the spiral rod revolves; but when the box is pushed down the teeth disengage, and the brass cylinder revolves around the rod which is then stationary.

It is also to be noted that the opening and closing of the forceps is wholly automatic. This mechanism is plainly shown in the cut and needs no explanation.

The forceps (*a*) are the ordinary hæmostatics with short upper ends. They are pivotted on a pin at (*b*) and are held open by a small spring, which cannot be seen in the drawing but which is just below this pivot.

The instrument is cleaned as follows: The pin at (*b*) which pivots the forceps is fastened to a plate. By turning this plate half round, the pin can be pulled out and the whole instrument taken apart. There is no point which cannot be easily reached and thoroughly cleaned. The forceps pull out of the shaft, the ring (*c*)

slides off, the shaft is taken off the spiral rod, the box (*g*) removed, and by unscrewing the cap from its upper end, the brass cylinder can be taken out. The arms (*f*) can be taken off, and, if desired, the thumb ring can be unscrewed. To allow of thorough cleanliness the number of different parts has been purposely made large. Some difficulty may be found in putting it together again. To do this: First, put the brass cylinder, with the toothed end *down*, into the box (*g*) screw the cap on, and slide the box upon the spiral rod; second, put the shaft on the rod; third, put the ring (*c*) on the shaft; fourth, push the forceps into place; fifth, re-insert the pin (*b*) and turn the plate to which it is attached back into position.

When taken apart it is complicated. When put together and ready for use, it is not complicated. It is simple, compact and strong.

The instrument has been made for me by Tiemann & Co., of New York. Mr. L. G. Pfarre, of this firm, has taken great pains in the details of its construction, which was very difficult on account of the tendency to friction between the various parts.

It is intended for illimited torsion, and can be safely used upon all vessels cut in any operation:

- (1) Upon the forearm and hand.
- (2) Upon the leg below the upper third, and the foot.
- (3) About the head and face.
- (4) Upon the surface of the body generally, as for the removal of tumors, for the radical cure of hernia, for plastics, etc.; and this class includes a very large proportion of all operations performed.

In comparing torsion with the ligature, it can be stated that every ligature is a foreign body in the wound at the time it is applied. Until recently, ligatures were treated as foreign bodies, and were removed

at a later period of the case. We now know that this is not necessary; that an aseptic ligature can be left in the wound, and that it ought to be taken care of in the healing process, being either absorbed or becoming encysted.

Notwithstanding this great advance in surgical detail, it would certainly be better if all wounds could be closed without containing any knots of foreign material; there is always the possibility that ligatures apparently aseptic, are not so; and, if aseptic, the wound has an extra amount of work in disposing of them. Where only one or two ligatures are applied, this work may be insignificant, but where any number are necessary, it must become an appreciable factor.

In torsion, however, no foreign substance is left in the wound. After torsion by this rapid method, the twisted ends are seen as small, compact knots, and these are apparently no greater hindrance to healing than are the ends of the vessels which project beyond the ligatures after tying.

Asepsis is more certain than with any form of ligature. The only object which comes in contact with the wound is the forceps; while in tying, in addition to the forceps, we have the ligature itself and the hands of the operator or assistant in tightening the knot.

Primary union ought to be facilitated, for it is obvious that where ligatures are aseptic and therefore innocuous, still, there can be no union of the cut surfaces at the points where they are applied until the foreign element has been removed by absorption or by encapsulation; and this must take a longer time than is needed in disposing of the small knots left by this instrument.

The writer wishes to express his indebtedness to Dr. J. C. Warren, to whom he is under very great

obligations for his kindness in giving an opportunity to use the instrument, and to test the method at a number of his operations at the Massachusetts General Hospital, last March. At these trials, which were upon cases where no large trunks were involved, bleeding was successfully and permanently checked.

Several defects in the instrument, which prevented it from working smoothly, were made apparent, and the experience obtained through this courtesy on the part of Dr. Warren, has been of the greatest assistance in perfecting these defects.

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